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Work Disability After Whiplash

A Prospective Cohort Study

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Study Design. Prospective cohort study.

Objective. To investigate the consequences of neck pain after motor vehicle accidents in terms of disability for work and the relationship this has with symptom and work-related factors.

Summary of Background Data. Previous studies on work disability related to whiplash are very heterogeneous, are often limited in sample size and show a wide variability in terms of results. A relationship has been suggested between poor recovery from or persistent work disability after whiplash and female gender, older age, marital status, heavy manual work, self-employment, prior psychological problems, subjective complaints of poor concentration, pain catastrophizing, and kinesiophobia.

Methods. Individuals with neck complaints after involvement in traffic accidents, who initiated compensation claim procedures with a Dutch insurance company (n = 879), were sent questionnaires (Q1) concerning the accident, the injuries that they had sustained, their complaints at that time, and questions regarding work and disability. The course of complaints and work disability was monitored at 6 (Q2) and 12 months (Q3) after the accident.

Results. A total of 58.8% of the population with neck complaints studied was work-disabled after the accident. Age and impaired concentration complaints after 1 month were found to be related to work disability at 1 year, independent of physical complaints and work characteristics.

Conclusion. Age and concentration complaints were important independent predictors of long-lasting work disability, whereas no evidence emerged to indicate that the degree of manual labor (blue or white collar work) or educational level was involved in persistent work disability in postwhiplash syndrome. The current results suggest that work disability could benefit most from interventions related to recovery from cognitive complaints and less from physically related interventions.

Key words: whiplash, postwhiplash syndrome, disability, WAD, whiplash associated disorder. **Spine 2009; 34:262–267**

Distortion or strain of the neck due to sudden movement of the head, is a prevalent injury after a motor vehicle accident. Following the original specific injury mechanism during a classic rear-end collision, accompanied by acceleration-deceleration and the whip-like movement of the head, this became known as whiplash. Nowadays, a specific injury mechanism is no longer considered a prerequisite, and any case with strain of the neck after an accident of any kind can be labeled as whiplash.[1] Muscular symptoms of strain of the neck usually heal in days to weeks. Persistent neck complaints, sometimes accompanied by cognitive complaints, are known as postwhiplash syndrome or whiplash-associated disorder (WAD). The persistent complaints have become a major medical problem, and source of a large body of research and polemic discussions.[1,2]

Research has shown that up to 40% of neck complaints may become chronic and persist for at least a year.[3] There is a vast amount of research concerning the incidence and course of complaint-related variables.[2] However, whiplash can also lead to long-term sick leave and the granting of disability pensions, the increased socioeconomic significance of which is only barely known.[4] Research has shown that sick leave and disability pension costs are much higher than the costs of acute medical care, demonstrating that these parameters are of paramount importance while evaluating the consequences of neck pain after motor vehicle accidents.[5] Furthermore, work disability could also be an important factor contributing to the persistence of complaints. Yet, work disability and related factors after whiplash have received only scant attention in previous research.[6]

Previous studies on work disability related to whiplash are very heterogeneous, often limited in sample size, and show a wide variability in results. Some studies report full or nearly full return-to-work numbers, or limited time of work suggesting that work disability after whiplash is only a minor problem.[1,6–11] On the other hand, other studies showed prolonged disability to be a major problem after whiplash.[12–14]

It is clear that, although some studies describe no or a limited duration of work disability after whiplash, it is evident that large discrepancies exist, most probably due to dissimilarities in studied populations and different definitions of (return to) work and work disability.

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Furthermore, only a limited number of studies investigated potentially underlying factors related to "return to work" and "persistent work disability," which may help explain the apparent discrepancies in the literature concerning the consequences of whiplash. To summarize, previous research suggests that the factors of female gender, older age, heavy manual work, and self-employment are related to poor recovery from or persistent work disability after whiplash.[1,5,9,12]

In light of the current discrepancies and the fact that sick leave and disability pension costs form a substantial part of the overall costs, this study investigates the prevalence and course of work disability in whiplash, focusing on the relationship between whiplash-related complaints, work characteristics, and work disability. The purpose of the current study is to analyze the consequences of neck pain after motor vehicle accidents in terms of disability for work and the relationship this has with symptoms and work-related factors.

■ Materials and Methods

Study Design

Victims of car accidents, who had initiated compensation claim procedures at a Dutch insurance company and who had presented themselves with neck complaints, were invited to participate in this study. The study used a prospective longitudinal design. Participants were assessed at 1 (Q1), 6 (Q2), and 12 months (Q3) after their accidents.

Participants and Procedure

Traffic-accident victims, who had initiated compensation claim procedures for personal injury with a Dutch insurance company, were asked to participate in this study. In the Netherlands, the settlement of personal injury claims is based on liability insurance, with the accident victims seeking compensation from the insurance company of the driver at fault. The letter of invitation clearly communicated that the present study was independent of the compensation procedure.

In the Netherlands, there is a social security system. Employees receive, for at least 1 year, at least 70% of their salary when becoming work disabled. Self-employed would have to be self-insured to receive a compensation when becoming work disabled.

During the total intake period, 3752 questionnaires were dispatched. The total number of initial questionnaires returned was 2295 (61.2%). In line with our previous studies, a total of 879 eligible responses, consisting of participants between 18 and 65 years of age, motor vehicle occupants after an accident that caused neck complaints and soft tissue injuries only, with no history of chronic pain and no self-reported loss of consciousness longer than 1 minute, were included and used for further analyses.[15–17]

Table 1. Basic Characteristics of the Assessment Points in the Studied Sample

	Neck Complaints at			
Variable	Q0 (Accident) N = 879	Q1 n = 728	Q2 n = 448	Q3 n = 384
Age (yrs), mean (SD)	36.4 (12.2)	36.5 (12.3)	36.9 (12.1)	37.4 (12.3)
Male, n (%)	340 (38.7)	271 (37.2)	159 (35.5)	136 (35.4)
Employment				
No work, n (%)	143 (16.3)	119 (16.3)	80 (17.9)	70 (18.2)
Paid employment, n (%)	702 (80.1)	578 (79.4)	346 (77.2)	292 (76)
Working hours, mean (SD)	32.7 (22.2)	32.4 (12.0)	32.2 (12.1)	32.1 (12.3)
Blue collar, n (%)	411 (58.5)	345 (59.7)	213 (61.6)	179 (61.3)
White collar, n (%)	289 (41.2)	231 (40.0)	132 (38.2)	112 (38.4)
Unknown, n (%)	2 (0.3)	2 (0.3)	1 (0.3)	1 (0.3)
Self-employed, n (%)	31 (3.5)	29 (4.0)	20 (4.5)	20 (5.2)
Working hours, mean (SD)	47.7 (11.9)	47.7 (16.6)	49.1 (14.0)	49.1 (14.0)
Blue collar, n (%)	20 (64.5)	20 (69.0)	17 (85.0)	17 (85)
White collar, n (%)	8 (25.8)	7 (24.1)	2 (10.0)	2 (10)
Unknown, n (%)	3 (9.7)	2 (6.9)	1 (5.0)	1 (5)
Work education (minimal level of education for described work)				
Unknown, n (%)	68 (7.7)	55 (7.6)	38 (8.5)	36 (9.4)
Primary school, n (%)	90 (10.2)	75 (10.3)	51 (11.4)	43 (11.2)
Lower sec. vocational, n (%)	398 (45.3)	336 (46.2)	207 (46.2)	175 (45.6)
Senior sec. vocational, n (%)	219 (24.9)	185 (25.4)	115 (25.7)	97 (25.3)
Higher education, n (%)	89 (10.1)	66 (9.1)	32 (7.1)	28 (7.3)
University, n (%)	15 (1.7)	11 (1.5)	5 (1.1)	5 (1.3)
Neck pain intensity,* mean (SD)		6.1 (2.3)	6.6 (2.1)	6.7 (2.1)
Neck stiffness,* mean (SD)		5.9 (2.6)	6.3 (2.5)	6.4 (2.5)
Severity of restricted neck movements,* mean (SD)		4.7 (2.4)	5.2 (2.3)	5.3 (2.3)
Radiating pain in arms,* mean (SD)		3.2 (2.7)	3.8 (2.9)	3.4 (2.9)
Paresthesia,* mean (SD)		2.7 (2.6)	3.1 (2.7)	3.2 (2.8)
Concentration complaints,* mean (SD)		3.9 (3.0)	4.5 (3.0)	4.6 (3.0)
Headache intensity,* mean (SD)		4.9 (2.9)	5.5 (2.8)	5.5 (2.7)
Dizziness, yes (%)		417 (57.3)	294 (65.6)	258 (67.2)
Use of medication, yes (%)		399 (54.8)	278 (62.1)	239 (62.2)

*10 point scale; 0 = no complaints, 10 = severe complaints.

Table 2. Characteristics of Work in Participants With Persistent Work Disability From Q1

	Work-Disabled At		
	Q1	Q2	Q3
	N = 247 (33.7%)	n = 138 (18.9%)	n = 92 (12.6%)
Paid employment, n (%)	234 (94.7)	129 (93.5)	85 (92.4)
Working hours, mean (SD)	32.6 (11.8)	32.1 (11.9)	33.7 (12.0)
Blue collar, n (%)	152 (65.0)	78 (60.5)	51 (60)
White collar, n (%)	82 (35.0)	51 (39.5)	34 (40)
Unknown, n (%)	0 (0)	0 (0)	0 (0)
Self-employed, n (%)	13 (5.3)	9 (6.5)	7 (7.6)
Working hours, mean (SD)	46.5 (9.9)	47.2 (8.7)	45.0 (10.4)
Blue collar, n (%)	10 (76.9)	7 (77.8)	6 (85.7)
White collar, n (%)	2 (15.4)	1 (11.1)	0 (0)
Unknown, n (%)	1 (7.7)	1 (11.1)	1 (14.3)

Questionnaires and Outcome Variables

After a median time of 21 days after the accident (mean = 23.7 days, SD = 13.0), we sent each claimant a questionnaire (Q1) concerning the accident, the injuries that they had sustained, their complaints at that time, and questions regarding work and disability. We monitored the course of the complaints and work disability at 6 months (Q2) and 12 months (Q3) after the accident. Table 1 gives an overview of the general items on the questionnaires.

Work Disability

All self-reported job descriptions were classified in terms of physically demanding labor (blue collar) and administrative or managerial work (white collar). Additionally, the minimal level of education of each job description was determined (primary school, lower or senior secondary vocational, higher or university education). Furthermore, the status in terms of self-employment or paid employment was determined. Self-reported work disability, working fewer hours because of reported complaints, was translated into a dichotomous variable for each assessment point to indicate work disability.

Analysis

Statistical analyses were conducted using SPSS version 14. Categorical variables were recoded into appropriate dummy variables before being used in the regression analysis.

■ Results

Of the 879 eligible participants with neck complains after the accident, 728 (82.8%) still had neck complaints at Q1, 448 (51.0%) at Q2, and 384 (43.7%) had persistent neck complaints at Q3. Of the 879 eligible participants, 70 (8.0%) did not return the questionnaire at Q2, and 47 (5.3%) did not return the third questionnaire. Table 1 provides an overview of the basic characteristics of participants with persistent neck complaints at the 3 assessment points.

The 733 participants with neck complaints after the accident, and who were involved in paid work (either paid employment or self-employed), were further analyzed regarding work disability.

In this group, 341 (46.5%) (16 of whom were self-employed) participants did not suffer from work disability. Furthermore, 141 (19.2%) participants were work-disabled, but had recovered before the first questionnaire was filled out. Four participants were work-disabled at Q1, but had recovered from neck complaints, and were therefore excluded. A total of 247 (33.7%) were work-disabled at Q1, 138 (18.9%) at Q2, and 92 (12.6%) at

Table 3. Univariate Analysis of the Relationship Between Work Characteristics and Concurrent Complaints, and Work Disability due to Postwhiplash Syndrome at Q1

						95% CI	
	Coefficient (β)	SE	Wald χ^2	*P*	Odds Ratio	Lower	Upper
Age	−0.004	0.008	0.256	0.613	0.996	0.982	1.011
Gender	0.139	0.169	0.677	0.411	1.149	0.825	1.601
Work class Blue/white collar	0.381	0.172	4.909	0.027	1.463	1.045	2.049
Work education*	−0.106	0.101	1.105	0.293	0.899	0.738	1.096
Employment	−0.178	0.383	0.215	0.643	0.837	0.395	1.773
Neck pain intensity	0.398	0.044	81.714	<0.001	1.489	1.366	1.624
Neck stiffness	0.221	0.035	39.723	<0.001	1.248	1.165	1.336
Severity of restricted neck movements	0.310	0.039	62.601	<0.001	1.363	1.263	1.472
Radiating pain in arms	0.208	0.032	41.525	<0.001	1.231	1.156	1.311
Paresthesia	0.153	0.033	21.914	<0.001	1.165	1.093	1.242
Concentration complaints	0.268	0.031	74.124	<0.001	1.307	1.230	1.390
Headache intensity	0.215	0.032	46.595	<0.001	1.240	1.166	1.320
Dizziness	0.969	0.175	30.680	<0.001	2.634	1.870	3.712
Use of medication	1.083	0.174	38.809	<0.001	2.953	2.101	4.152

Univariate logistic regression. Work disability at Q1 used as dependent variable. Variables from Q1.
*Recoded into dummy variables because of non-significance, mean results presented.

Table 4. Multiple Logistic Regression Model of Significant Work Characteristics, Concurrent Complaints and Work Disability Due to Postwhiplash Syndrome at Q1

	Coefficient (β)	SE	Wald χ^2	P	Odds Ratio	95% CI Lower	95% CI Upper
Work class	0.203	0.198	1.055	0.304	1.226	0.831	1.807
Neck pain intensity	0.236	0.061	14.986	<0.001	1.266	1.124	1.427
Neck stiffness	−0.057	0.052	1.210	0.271	0.945	0.853	1.046
Severity of restricted neck movements	0.145	0.055	6.884	0.009	1.156	1.037	1.288
Radiating pain in arms	0.065	0.049	1.750	1.186	1.068	0.969	1.176
Paresthesia	−0.064	0.050	1.657	0.198	0.938	0.850	1.034
Concentration complaints	0.155	0.037	17.119	<0.001	1.167	1.085	1.256
Headache intensity	−0.004	0.042	0.010	0.921	0.996	0.917	1.081
Dizziness	0.407	0.209	3.780	0.052	1.503	0.997	2.265
Use of medication	0.460	0.206	4.956	0.026	1.584	1.057	2.374

Variables from Q1. Work disability at Q1 used as a dependent variable.

Q3. Table 2 provides an overview of work characteristics for these groups.

Analyses revealed no significant difference between participants who were self-employed or who had paid employment regarding work disability after the accident ($\chi^2 = 0.288$, $df = 1$, $P = 0.591$), and work disability at Q1 ($\chi^2 = 3.622$, $df = 1$, $P = 0.057$), Q2 ($\chi^2 = 3.728$, $df = 1$, $P = 0.053$), and Q3 ($\chi^2 = 2.185$, $df = 1$, $P = 0.139$), although the differences at Q1 and Q2 showed borderline significance.

Work Disability and Concurrent Variables

The relationship among work characteristics, concurrent complaints, and work disability at 1 (Q1), 6 (Q2), and 12 (Q3) months was further investigated. The univariate analysis of work disability at Q1 is presented in Table 3. The significant variables were used in a multiple logistic regression analysis, the results of which are presented in Table 4. Results show that work disability at Q1 is independently associated with higher neck pain intensity, more severe restriction of neck movements, more intense concentration complaints, and consumption of medication at Q1.

Similar analyses were conducted for concurrent complaints and work disability at Q2 and Q3. The results for Q2 revealed that work disability at Q2 was independently associated with concurrent neck pain intensity (odds ratio = 1.302, 95% CI = 1.098–1.544) and concentration complaints (odds ratio = 1.337, 95% CI = 1.210–1.478) at Q2.

At Q3, only concurrent concentration complaints (odds ratio = 1.404, 95% CI = 1.237–1.593) were significantly related to work disability, independent of other physical complaints and work characteristics.

Work Disability and Predictive Variables

To investigate the predictive value of investigated variables for continued work disability at 6 and 12 months, we conducted a second analysis using the group with work disability at Q1. First, a univariate analysis was performed using variables from Q1 as independent variables, and work disability at Q2 as a dependent variable, which yielded similar significant variables as presented in Table 3, with the exception of work class, which was not significant, and age, which now was found to be significantly related to work disability at Q2. Table 5 shows the results of a multiple logistic regression analysis using the significant variables from the univariate analysis. Results reveal that work disability at Q2 is independently associated with relatively intense concentration complaints

Table 5. Multiple Logistic Regression Model of Significant Work Characteristics, Complaints at Q1 and Work Disability due to Postwhiplash Syndrome at Q2

	Coefficient (β)	SE	Wald χ^2	P	Odds Ratio	95% CI Lower	95% CI Upper
Age	0.019	0.011	3.395	0.065	1.020	0.999	1.041
Neck pain intensity	0.095	0.070	1.831	0.176	1.099	0.958	1.261
Neck stiffness	−0.088	0.061	2.086	0.149	0.916	0.813	1.032
Severity of restricted neck movements	0.048	0.065	0.560	0.454	1.050	0.925	1.191
Radiating pain in arms	0.030	0.056	0.292	0.589	1.031	0.923	1.151
Paresthesia	0.079	0.057	1.963	0.161	1.083	0.969	1.210
Concentration complaints	0.224	0.043	26.520	<0.001	1.251	1.149	1.362
Headache intensity	0.091	0.051	3.175	0.075	1.095	0.991	1.211
Dizziness	0.180	0.259	0.484	0.487	1.197	0.721	1.987
Use of medication	0.350	0.249	1.976	0.160	1.419	0.871	2.312

Variables from Q1. Work disability at Q2 used as a dependent variable.

Table 6. Multiple Logistic Regression Model of Significant Work Characteristics, Complaints at Q1 and Work Disability due to Postwhiplash Syndrome at Q3

	Coefficient (β)	SE	Wald χ^2	P	Odds Ratio	95% CI	
						Lower	Upper
Age	0.028	0.012	5.264	0.022	1.028	1.004	1.052
Neck pain intensity	0.060	0.082	0.541	0.462	1.062	0.904	1.248
Severity of restricted neck movements	−0.082	0.066	1.543	0.214	0.922	0.810	1.048
Radiating pain in arms	0.005	0.065	0.006	0.937	1.005	0.886	1.141
Paresthesia	0.074	0.064	1.324	0.250	1.077	0.949	1.222
Concentration complaints	0.217	0.049	19.437	<0.001	1.242	1.128	1.368
Headache intensity	0.068	0.060	1.268	0.260	1.070	0.951	1.204
Dizziness	0.446	0.315	2.010	0.156	1.562	0.843	2.895
Use of medication	0.391	0.299	1.718	0.190	1.479	0.824	2.655

Variables from Q1. Work disability at Q3 used as a dependent variable.

at Q1, with higher age and headache intensity showing borderline significance.

Finally, analyses using variables from Q1 and work disability at Q3 were performed. Univariate analyses again indicated that age was significant related to work disability at Q3. In contrast with the results presented in Table 3, work class and neck stiffness at Q1 were not significantly related to work disability at Q3. Table 6 shows the results of a multiple logistic regression analysis using the significant variables. Results reveal that work disability at Q3 is independently associated with higher age and more concentration complaints at Q1, independent of other physical complaints at Q1 and work characteristics.

To test this finding further, we added the interaction between combined complaint severity and work class, as well as the interaction between concentration complaints and work class as independent variables to the regression model presented in Table 6, showing no significant interaction.

■ Discussion

Our results show that work disability due to postwhiplash syndrome after a motor vehicle accident is a common problem. A total of 58.8% of the studied population with neck complaints was work-disabled after the accident. However, the vast majority of this group recovered from work disability in the first year: 31.3% in the first month, 66.7% in the first 6 months, and 78.3% in the first year, leaving 21.7% participants with persistent work disability after 1 year (12.6% of the individuals with initial neck complaints), which is in line with the reported 12% return from work disability in the first year reported in a previous research by Kasch *et al*.[10] However, it is much lower than the 44% reported by Holm *et al*, most probably because of population differences.[10,12]

Our univariate analysis shows several factors, especially those related to physical complaints, to be related to concurrent work disability. Even more relevant, the multiple regression models reveal that in the first month, physical factors such as higher neck pain intensity, more restricted neck movements, and use of medication, are independently related to work disability, together with impaired concentration. At 6 months, concurrent higher neck pain intensity and more concentration complaints were found to be related to persistent work disability. In line with previous research, concentration complaints were found to be related to concurrent work disability at 12 months.[8]

Although one might expect disability for white collar work to be more affected by concentration problems, our results surprisingly show that prolonged work disability is related to concentration complaints independent of the degree of manual labor (blue or white collar work) or level of education. Apparently, concentration complaints affect the ability to work regardless of the level of manual labor or level of education. In contrast with previous research, we found neither self-employment nor gender to be a significant predictive factor related to work disability.[5,9]

Regarding the analysis of the predictive value of parameters, age and impaired concentration complaints were found to be the only factors available at 1 month that were related to work disability at 1 year, independent of physical complaints and work characteristics. The intensity of concentration complaints could be an indication of depressive or anxiety symptoms. It would, therefore, be important for future research to investigate whether anxiety or depressive symptoms are indeed related to persistent work disability. The current results suggest that work disability could benefit most from interventions related to recovery from cognitive complaints and less from physically related interventions.

Although the relevance of age in regard to functional recovery from postwhiplash syndrome is a subject of discussion, our results clearly sustain the view that prolonged work disability is most pronounced in higher age groups.[2]

Interestingly, previous research consistently found early neck pain intensity to be a main factor related to recovery after 1 year.[15–17] Our results indicate that this is not the case for work disability, indicating that the prediction of functional outcome parameters, although being more rele-

vant in regard to overall costs, cannot readily be deduced from research on complaint-related recovery.

Some comments regarding the limitations of this study are in order. The study group consisted of participants who had initiated compensation claim procedures. However, since the threshold for starting such procedures is low in the Netherlands, there seems to be no strong reason to suspect that this introduced a bias toward patients whose complaints were more serious.[18]

The damage-report forms that are used for claiming car damage, and which are usually completed within a few days after the accident, contain a section for the names of victims and their complaints. We directly invited all claimants from these forms, including victims who had not visited an emergency room or sought medical help at the time of the accident; this, thereby, prevented a selection based on medical help-seeking.

Furthermore, although the insurance company and victims can be seen as opposing parties, most personal injury claims in the Netherlands, even large ones that involve serious injuries, are settled out of court. None of the participants was involved in actual litigation. Nevertheless, some studies have recently found that compensation is a critical factor to be considered when studying postwhiplash syndrome. Therefore, the personal injury claimant context should be taken into account while interpreting or generalizing our findings.[19]

Compensation data or pensions for work disability data are very difficult to compare across various countries. Comparison is hampered by differences in the instruments used, the timing of measurements, the inclusion criteria and the different definitions of work disability. Furthermore, work disability and especially work compensation, which is often used as an indication of work disability, is determined very differently in various countries because of different social security systems or disability pensions.

As most other studies using compensation or disability pension data have done, we similarly determined work disability, therefore, on the basis of self-report questionnaires. However, it should be acknowledged that any questionnaire-based data holds a risk of self-report bias.

In sum, this study clearly showed that work disability due to postwhiplash syndrome is not only a common problem but also that in a considerable number of cases work disability takes a chronic course. Age and concentration complaints were identified as important independent predictors of such long-lasting work disability, whereas no evidence emerged to indicate that the degree of manual labor (blue or white collar work) or educational level was involved in persistent work disability in postwhiplash syndrome.

■ Key Points

- The consequences of neck pain after motor vehicle accidents in terms of disability for work and the relationship that this has with symptom and work-related factors.
- Age and concentration complaints are important independent predictors of long-lasting work disability.
- No evidence emerged to indicate that the degree of manual labor (blue or white collar work) or educational level was involved in persistent work disability in postwhiplash syndrome.
- Work disability could benefit most from interventions related to recovery from cognitive complaints and less from physically related interventions.

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